A Little-known Peculiarity of the Hamadryad Snake.

A STRUCTURAL peculiarity of the "king cobra" which I have recently ascertained while studying the anatomy of the Ophidia seems to me to be so remarkable that it must have been noticed in such comprehensive works as Bronn's "Thierreich" and Dr. Gadow's account of serpents in the "Cambridge Natural History" were it known. I venture, therefore, to give a short account of the matter without professing to have made an exhaustive survey of the literature of the group. The windpipe of this snake opens, as usual, not far from the heart into the lung, which presents no remarkable divergencies from the lungs of other snakes; it is in the same way functional as a lung for the first half, and becomes a mere thin-walled air bag posteriorly. Before opening into the lung, however, the trachea is connected with a long series of approximately equi-sized air sacs in the neck, which follow close upon each other, and entirely occupy the neck down to the region where the heart lies. These sacs are so closely adpressed that the appearance given is that of a series of septa, dividing the space surrounding the windpipe and gullet into metamerically arranged compartments. I thought at first, in fact, that I had been able to observe a segmentation of the cœlom in this region quite analogous to that of an annelid. Each cavity, however, is continuous with the interior of the windpipe by an oval and clearly defined orifice on its lower surface. These apertures are regular and of fairly equal size, and give to the windpipe quite the appearance of a flute. There are a large number of them, thirty to forty. There is no question here of pathological conditions or of accidental cuts. The regularly disposed series of sacs into which they open negatives anything of the kind. They are, I suppose, an extreme modification of what the late Prof. Cope termed the "tracheal lung" in Chersydrus and other snakes. The most obviously comparable structure that I can think of for the moment is the ventral slit in the windpipe of the emu, which similarly opens into a thin-walled sac. This is believed to be connected with the singular "drumming" sound emitted by that bird. Perhaps some of your readers who are acquainted with the Hamadryad can inform me as to a possible "voice," or whether it can produce a varied or especially prolonged hiss. I propose to offer a more detailed account of the structure of the windpipe and other organs of this snake to the Zoological Society as soon as possible.

FRANK E. BEDDARD.

The New Bishop's Ring.

REGARDING M. Forel's suggestion (see NATURE, p. 396) that persons ascending to considerable altitudes should observe whether the ring around the sun, which was so noticeable a phenomenon after the diffusion of the volcanic dust from the Krakatoa eruption in 1883, is again visible, I beg to say that, before reading his letter in *La Gazette de Lausanne*, I had noted the ring on August 20 from the Montanvert, near Chamonix, at an altitude of 6300 feet. The day was exceptionally clear, and when a peak hid the sun itself, the whitish glare fringed with reddish brown that surrounded it attracted my attention. Being upon the summit of Mont Blanc (15,780 feet) on September 1, in clear weather, I again observed the ring, which, however, was no better defined than lower down on the mountain, notwithstanding the circumstance that the dark blue sky furnished an excellent background. Angular measurements there showed that the radius of the visible outer limit of the reddish ring was between 20° and 25°.

While the phenomenon was not again seen by me last summer in Europe, it has often been observed during the past year here at my observatory, elevated only 640 feet above the sea, and an article in *Science* of January 23 by my assistant, Mr. Clayton, describes the reappearance of this second "Bishop's ring" and the accompanying brilliant sunsets during the early part of last winter. Subsequently, the ring was observed in January and February, and also in May, June, and July, when highly coloured and prolonged afterglows followed the sunsets towards the close of the latter month. During the first part of August the ring was seen on clear days, and during September the vivid yellow colour of the western sky, persisting sometimes more than an hour after sunset, was frequently recorded. To-day (October 14), after a period of rainy weather, the ring is distinct, and measurements made here some time ago gave 26° as the radius of the whitish haze and 5° more for the reddish border, indicating that its visible extension was greater even than on Mont Blanc.

M. Forel states that he has seen a coloured circle surrounding the sun since the first of last August. The fact of it not having attracted notice previously in Europe would seem to show either that the clearer atmosphere of the United States favours its perception, or that the microscopic dust in the upper air, which is supposed to produce the diffraction phenomenon, preponderates above this country. The last hypothesis is supported by the fact that, from the proximity of the West Indian volcanoes, the fine dust ejected by them during the eruptions that year may have drifted northward, before making a circuit of the globe, and a larger quantity may still remain suspended in the rarefied atmosphere above the eastern United States than exists over Europe.

A. LAWRENCE ROTCH.

Blue Hill Meteorological Observatory, Massachusetts, U.S.A., October 14.

The Nervous System of Anodonta cygnea.

THE supra-œsophageal ganglion of Anodonta is usually regarded as representing both the cerebral and pleural ganglia, and is commonly spoken of as the "cerebro-pleural." Prof. Howes mentions in his "Atlas" that Prof. M. Hartog has occasionally observed a ganglionic swelling on one or both of the cerebro-visceral connectives in front of the pericardium, but that he himself has failed to find any such enlargement. In view of the doubt that exists, it seems to be worth recording that yesterday one of my pupils, A. C. Roxburgh, while dissecting an Anodonta in the Charterhouse laboratory, exposed a well-developed ganglion of the usual orange colour, upon the left connective in the exact position mentioned by Prof. Hartog. Microscopical examination removed all doubt as to the nature of the swelling. for numerous ganglion-cells were easily recognised in the teased preparation. It is thus probably more correct to term the anterior ganglion "cerebral" rather than cerebro-pleural. Perhaps some of those who are better equipped for research than is possible or advisable for those engaged in elementary laboratories might find it worth while to examine series of sections of the connective at this region. It is possible that the pleural ganglion may in most cases be represented by but a few ganglion cells the presence of which is not discernible to the unaided eye.

May I, as I am writing about this animal, direct attention to an error that is universal in text-books? The muscles always spoken of as retractors and protractor of the *foot* have not the function that their titles imply. The protrusion of the foot is due to vascular turgescence, and its withdrawal to relief of the turgid condition and contraction of the intrinsic pedal muscle fibres. *The muscles in question move the shell, the foot being the fixed point.* Thus the so-called anterior and posterior retractors of the foot should be styled the *protractors of the shell*, and the protractor of the foot the *retractor of the shell.* I may mention that I have often seen Anodonta go backwards when its deliberate movements have led it into a *cul-de-sac* in the aquarium.

OSWALD H. LATTER.

Charterhouse, Godalming, October 24.

LORD KELVIN AND HIS FIRST TEACHER IN NATURAL PHILOSOPHY.

SOME interesting early recollections were related by Lord Kelvin on October 17, on the occasion of the unveiling of a stained glass window, by Henry Holiday, in the Bute Hall of the University of Glasgow in memory of John Pringle Nichol, LL.D., professor of astronomy, 1836–1859, and his son and daughter, John Nichol, LL.D., professor of English language and literature, 1862–1889, and Mrs. Jack, who was born in 1837, in the University, and died there in 1901. Prof. J. P. Nichol was the author of numerous valuable works, including the famous book on the "Architecture of the Heavens." The account which Lord Kelvin gave of his own young days at

Glasgow College is full of interest, and his testimony to the impulse he received from his early teacher will be an enduring tribute to Nichol's memory.

In the course of his remarks, Lord Kelvin said:—Principal Story, You recall to my mind the happy days of long past years, 1836, when John Pringle Nichol came to be professor of astronomy in the University of Glasgow. From the time he first came among us—I say among us, because I, as a child, was not then a member of the university, but an inhabitant of the university—when Dr. Nichol, as we then called him, came among us, he became a friend of my father, and that friendship lasted to the end of my father's life. I may also claim that I became a student of Dr. Nichol's from the time he first came to Glasgow. Year after year passed, and I still remember his inspiring influence. The work on which I am engaged at this day is work to which I was initiated in the years 1837, 1838, and 1839, when I was a child. The summer of 1840 is for me a memorable summer, a year of brightness in my memory. I had been for one session a student in the natural philosophy class of the university conducted by Dr. Nichol. From beginning to end, with the exception of a few days, when my predecessor, Dr. Meikleham, began the course which he could not continue on account of his health, the class of natural philosophy, in the session 1839–40, was taught by Dr. Nichol. He came on short notice to occupy the post, and he did it in a most admirable manner. I lately had the opportunity allowed me by my friend and colleague, Prof. Jack, to see a manuscript book of John Pringle Nichol's, a book of exercises and preparations for the natural philosophy class. I was greatly struck with it, and much interested to see in black and white the preparations he made for the splendid course of natural philosophy that he put us through during the session 1839–40. In his lectures the creative imagination of the poet impressed youthful minds in a way that no amount of learning, no amount of mathematical skill alone, no amount of knowledge in science, could possibly have produced. For, many years afterwards, one of the most important affairs I have ever had to do with began with what I learned in the natural philosophy class in that session. I remember the enthusiastic and glowing terms in which our professor and teacher spoke of Fourier, the great French creative mathematician who founded the mathematical theory of the conduction of heat. I was perfectly astonished. I remember how my youthful imagination was fired with what I heard from our teacher. I asked him, "Do you think I could read it?" He said, "The mathematics is very difficult." At the end of the session I got hold of the book ("Théorie analytique de la Chaleur") out of the university library, and in the first half of the month of May, 1840, I had, I will not say read through the book, I had turned over all the pages of it. Then we started out from Glasgow for Germany, the joint families of my father, my brothers and sisters, and our friend Dr. Nichol and Mrs. Nichol, and John Nichol and Agnes Jane Nichol. The two families made together a tour in Germany, and during two months or six weeks in Frankfort, Mrs. Nichol and her two children were with my father and his family every day while their father went on tour to the Tyrol. Excuse me for speaking of those old times. I am afraid I have trespassed on your patience. These recollections may be nothing to you, although they are dear to me. They are, indeed, closely connected with the subject of the present meeting.

While we were encamped for a time in Bonn, Dr. Nichol took me and my elder brother on a walking tour in the volcanic region of the Eifel. We had four days of intense enjoyment, and the benefit of what we learned from him, and saw around us, in that interesting region remained with my brother all his life, and remains with me.

I have to thank what I heard in the natural philosophy class for all I did in connection with submarine cables. The knowledge of Fourier was my start in the theory of signalling through submarine cables, which occupied a large part of my after life. The inspiring character of Dr. Nichol's personality and his bright enthusiasm lives still in my mental picture of those old days.

The old astronomical observatory—the Macfarlane Observatory—was situated in the upper part of the old college green, or garden, as we used to call it, behind the college, off the High Street. I do not suppose any person here ever saw the old college green, but you have all read of it in "Rob Roy," and of the duel between Osbaldistone and Rashleigh. I do not remember the details of the duel, but I remember it was appointed to be fought in the upper part (at least I have always assumed, in my mind, it was in the upper part) of the college garden of the University of Glasgow. The garden was in two parts, the lower on the near side of the Molendinar, the upper on the higher ground beyond the stream, which we crossed by a bridge. Has any person here ever seen the Molendinar? There used to be mills on it, I assume, from the name. It is now a drain! Before we left the old college it was covered in. We had still the upper and lower green, but the Molendinar flowed unseen for many years after the university left the old site. I remember in the Macfarlane Observatory beautiful experiments on light shown us in the most delightful way by Dr. Nichol, Grimaldi's fringes by sunlight, and prisms showing us splendid solar spectra, and telescopes, and brilliant colours on a white screen produced by the passage of polarised light through crystals. He gave us firmly the wave theory of light, and introduced us to Fresnel's work. As he appreciated Fourier, so he appreciated Fresnel, two of the greatest geniuses in science, and fired the young imagination with the beautiful discoveries of those men. In that old observatory in the high green, and in the natural philosophy class-room of the old Glasgow college, was given to me the beginning of the fundamental knowledge that I am most thoroughly occupied with to this very day, and I am forcibly obliged to remember where and when my mind was first drawn to that work which is a pleasure to me, and a business to me just now, and will, I hope, be so for as long as I have time to work. You can imagine with how much gratitude I look upon John Pringle Nichol and upon his friendship with my father. His appointment as professor of astronomy conferred benefit, not only upon the University of Glasgow, but also upon the city and upon Edinburgh, and the far wider regions of the world, where his lectures were given and his books read. The benefit we had from coming under his inspiring influence, that creative influence, that creative imagination, that power which makes structures of splendour and beauty out of the material of bare dry knowledge, cannot be overestimated.

FLOW OF STEAM FROM NOZZLES.

IT is well known that when a gas is flowing from a vessel by an orifice, if the outside pressure is less than sp_0, p_0 being the pressure in the vessel where the gas is at rest, the pressure in the throat of the orifice is never less than sp_0 if s is

$$\left(\frac{2}{\gamma+1}\right)^{\frac{\gamma}{\gamma-1}}$$

where γ is the ratio of the specific heats. s is 0·527 for air. It is also known that, with fair accuracy, we